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Soil and Water Conservation : Extension Circular 5-31-2

Harold H. Gilman

Russell E. Weiss

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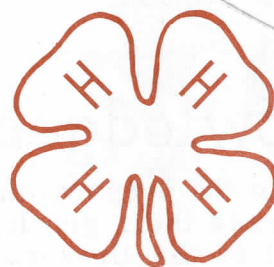
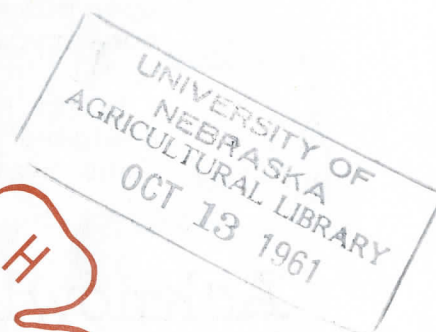
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SOIL and WATER

CONSERVATION



A Beginning project in Soil and Water Conservation for 4-H Club Members

EXTENSION SERVICE
UNIVERSITY OF NEBRASKA COLLEGE OF AGRICULTURE
AND U. S. DEPARTMENT OF AGRICULTURE
COOPERATING
E. F. FROLIK, DEAN E. W. JANIKE, DIRECTOR

DEE
Course

SOIL and WATER CONSERVATION

To the 4-H Member:

A knowledge of soil and water conservation is important.

Your future success in any endeavor in Nebraska depends upon how well you learn and undertake the responsibility for conserving our basic natural resources - Soil and Water.

This is the first in a series of 4-H conservation projects designed to explain to you the principles of Soil and Water Conservation.

Acknowledgements:

In the preparation of this publication the authors wish to express their gratitude to the following individuals on the staff of the University of Nebraska: Dr. Leon Chesnin, Associate Professor, Kenneth Schmidt, Associate 4-H Leader, Emery Nelson, County Extension Agent.

Harold H. Gilman - Extension Conservationist
Russell E. Weiss - Extension Agronomist (Soils)

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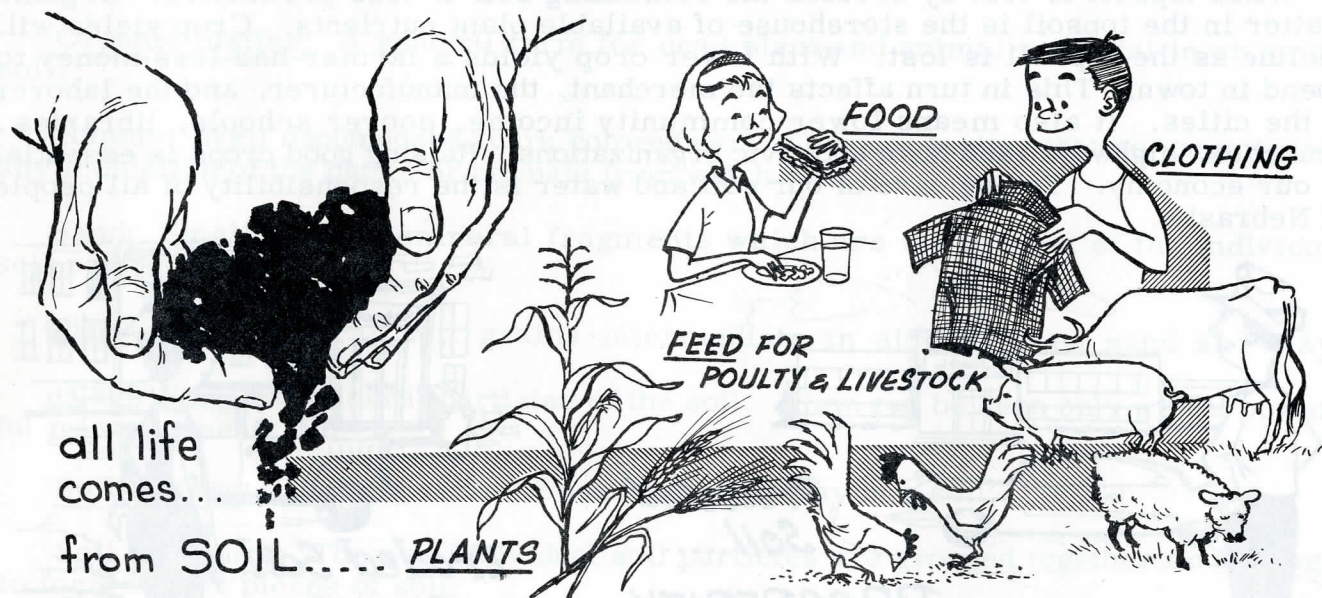
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UNIT

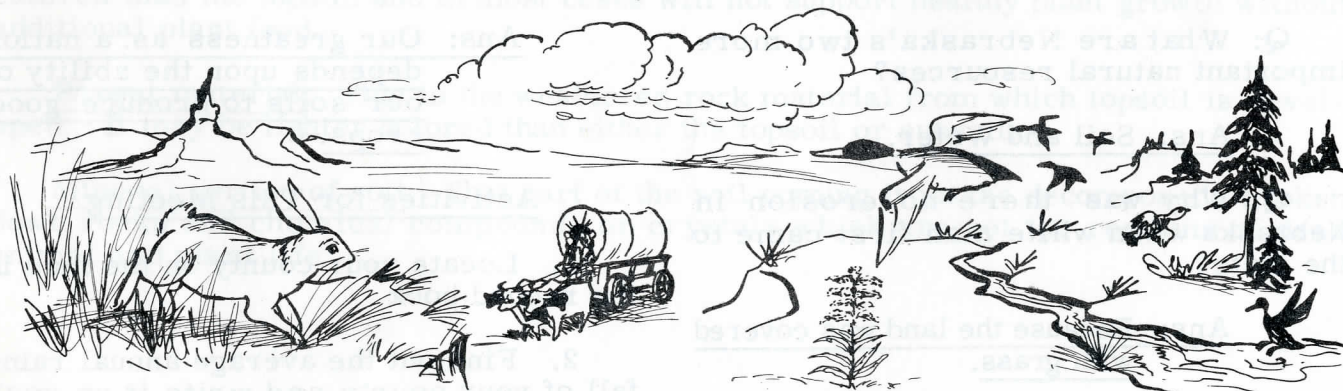
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Some facts about our state

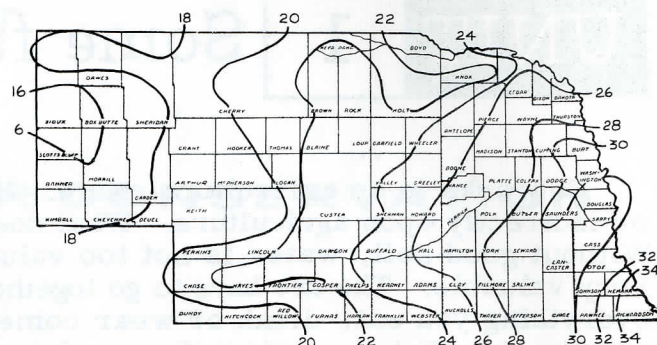
Nebraska is an agricultural state. Everyone living in Nebraska depends directly or indirectly upon agriculture. What does agriculture depend upon? Soil and Water. Without good soil, water is not too valuable. Without water, even good soil is not very valuable. The two have to go together to make a prosperous agriculture. Almost everything you eat, drink or wear comes from the soil, even lumber for the house you live in. It is important that you learn to take care of the soil and water resources of our great state in order to supply the needs of future Americans.



When the white man first settled Nebraska, he found little erosion. He found the hills covered with a dense growth of grass, underlain with a thick mat of decaying debris. The valleys were even more densely covered with grasses and sedges. The soil underneath the prairie was black and spongy; the result of centuries of accumulating plant material. Clear water flowed constantly in the streams. There were flowing springs in many of the draws. Tall grasses with the underlying trash provided a condition for rapid absorption of rainfall and for holding winter snow. Under these conditions, runoff occurred only from extremely heavy rains.



The annual rainfall in Nebraska is not very dependable. Records indicate an average rainfall range from 16 inches per year in the extreme western regions of the state to about 34 inches in the south eastern part. Periods of below normal rainfall are quite frequent. This is a very important factor in our study of soil and water conservation. We must try to store as much of the annual rainfall as possible so that it will be available to crops in the years of low rainfall.



AVERAGE ANNUAL RAINFALL (inches)

When topsoil is lost by erosion the remaining soil is less productive. Organic matter in the topsoil is the storehouse of available plant nutrients. Crop yields will decline as the topsoil is lost. With lower crop yields a farmer has less money to spend in town. This in turn affects the merchant, the manufacturer, and the laborer in the cities. It also means lower community income, poorer schools, libraries, churches, highways, and farm and civic organizations. Raising good crops is essential to our economy. Taking care of our soil and water is the responsibility of all people of Nebraska.



Questions and Answers

Q: What do people living in Nebraska, directly or indirectly, depend upon for a living?

Ans: Agriculture.

Q: What are Nebraska's two more important natural resources?

Ans: Soil and Water.

Q: Why was there no erosion in Nebraska when white man first came to the state?

Ans: Because the land was covered with grass.

Q: What is the average rainfall in Nebraska?

Ans: 16 inches in the west; 34 inches in the southeast.

Q: Why is it important to take care of the soil?

Ans: Our greatness as a nation depends upon the ability of our soils to produce good crops.

Activities for This Meeting

1. Locate your county on the map in the record book.
2. Find out the average annual rainfall of your county and write it on your map.

UNIT 2 What is soil --

How is it formed?



NEW WORDS TO LOOK FOR:

Weathering: The breakdown or decomposition of rocks by nature.

Organic matter: A general term for dead plant and animal material in or on the soil.

Humus: Well decomposed, dark colored part of organic matter that no longer gives any indication of the plants or animals from which it came.

Sand: Small rock or mineral fragments which are the largest of the individual soil particles.

Silt: Small mineral soil grains intermediate in size between sand and clay.

Clay: Smallest mineral particles of the soil. They can be seen only with a powerful microscope.

Soil texture: The proportion of sand, silt and clay in a soil.

Soil structure: The way individual soil particles are grouped together or arranged to form larger pieces of soil.

Soil tilth: The physical condition of a soil with reference to the ease with which it can be cultivated.

Topsoil: A term applied to the surface layer of the soil. This is the darkest colored because it is highest in organic matter. It is the most fertile part of the soil. It is from this layer that plants get most of their food supply and roots are the thickest.

Subsoil: A term applied to the soil layer below the topsoil. It is usually lighter colored than the topsoil and in most cases will not support healthy plant growth without additional plant food.

Parent material: This is the weathered rock material from which topsoil is developed. It may be lighter colored than either the topsoil or subsoil.

Mineral portion of soil: That part of the soil coming from the decomposed, broken down rocks and chemical compounds or crystals which are not the remains of dead animal and plant life.

Soil

Soil covers the earth much the same as the peeling covers an orange or grapefruit. The thickness of soil, however, is not nearly as uniform as the fruit peeling. Soils high up on mountain sides are very thin, while soils along streams may be very thick.

Soil is a mixture of many materials. These materials may exist in three forms - solid, liquid and gaseous. Scientists make a further division of the solids into two main groups, the mineral portion and the organic portion.

The mineral portion of soil comes from natural decomposition or break down of rocks and the organic portion comes from the decay of dead plants.

The liquid portion of the soil consists of water containing dissolved mineral matter, carbon dioxide, and oxygen.

The gaseous portion of the soil is made up of the same gases that are in air. However, they may be in different proportions than the air we breathe. A good soil will have well proportioned amounts of mineral materials, organic materials, water and air.

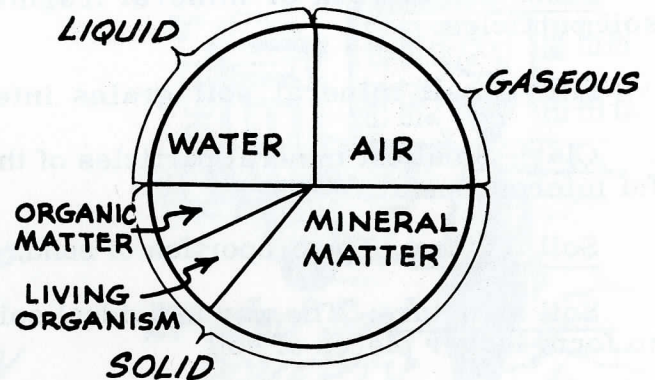
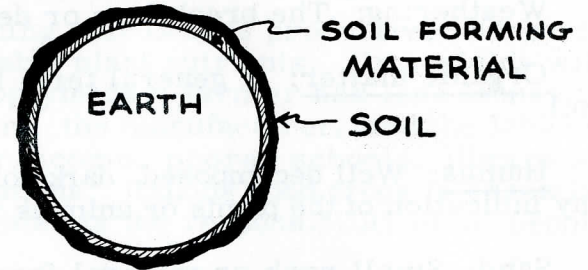
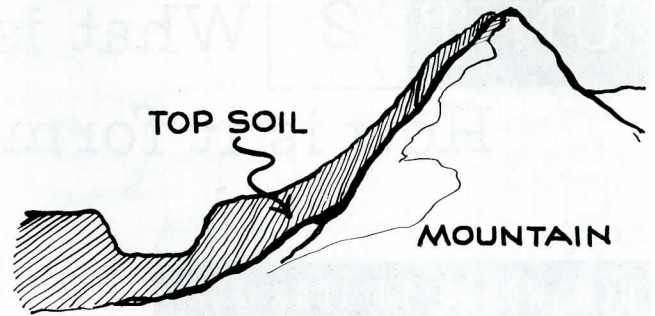
The Origin of Soil

The origin of most soils is rock. No rock is so hard that it cannot be broken up. Rocks are broken to pieces in many ways. Very small pieces or particles of rock are the beginning of soil.

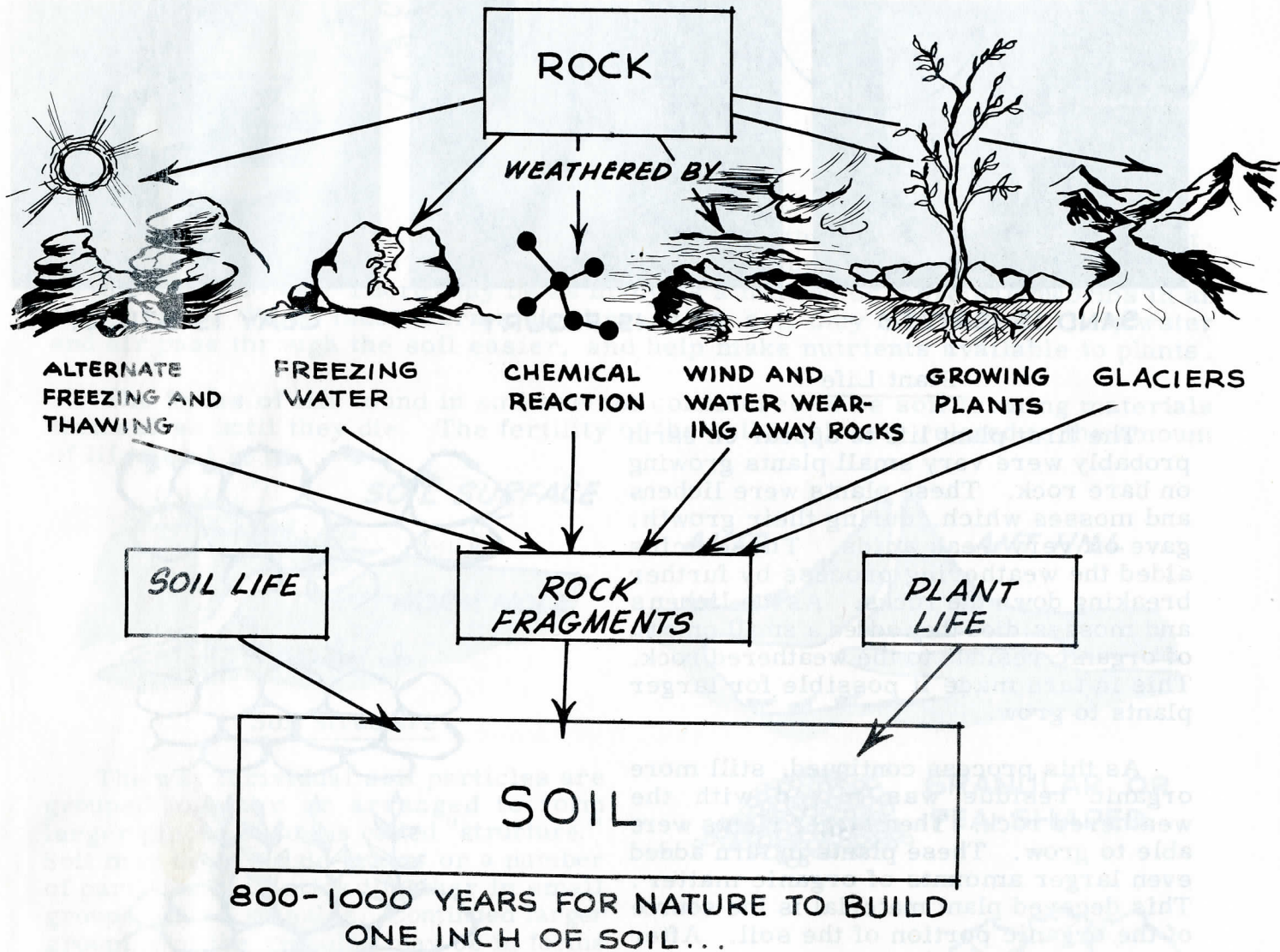
Processes by which rocks may be broken up are called weathering. Some factors concerned in weathering are:

1. Alternate warming and cooling.
2. Freezing water.
3. Chemical reactions dissolving rocks.
4. Wind and water wearing away rocks.
5. Growing plants.
6. Glacier action.

Material formed from these processes is the mineral portion of the soil.



Not all particles of the weathered rock are the same size. There are three main types and sizes of soil particles: sand, silt and clay. Each can be identified by the sense of touch and by ribboning a piece of moist soil between your fingers.



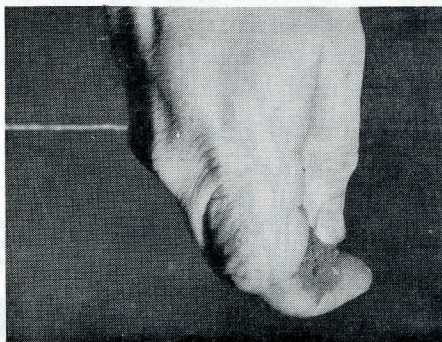
Soil Texture

Coarse soil particles are called sand. Most sand particles can be seen without a magnifying glass. All sand particles feel rough when rubbed between the thumb and fingers.

The relatively fine soil particles that feel smooth and floury are called silt. When wet, silt feels smooth, but not slick or sticky. If it is dry, silt that is pressed with the thumb or finger will retain the imprint. Silt particles are so fine that they can be seen only with the aid of a microscope.

Clay contains the smallest soil particles. Clay particles can be seen only with the aid of a powerful microscope. When dry, clay particles feel smooth or powdery. Large chunks of clay particles are very hard and difficult to break when dry. When wet, clay becomes slick and sticky. Wet clay may be molded and will hold the form into which it is molded.

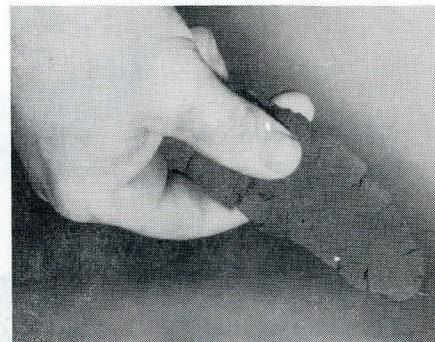
The texture of a soil is determined by the amounts of sand, silt and clay that make up the soil. The amount of sand, silt or clay particles can be determined by the sense of touch - by ribboning a piece of moist soil between your fingers.



SAND IS GRITTY



SILT IS FLOURY

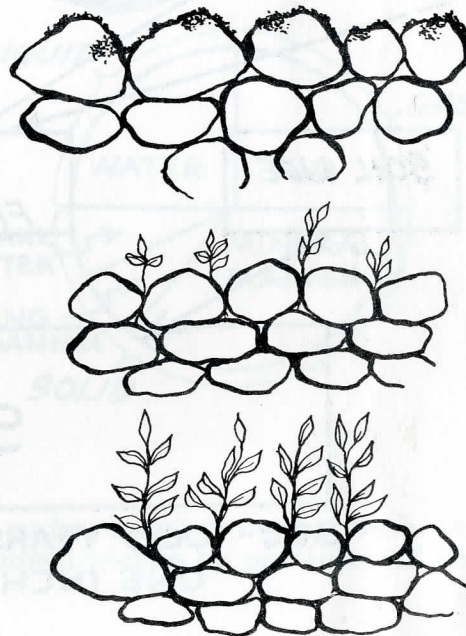


CLAY IS STICKY

Plant Life

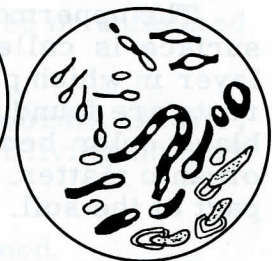
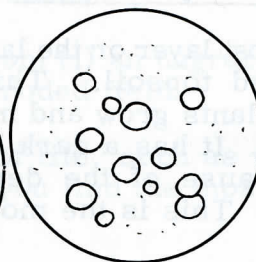
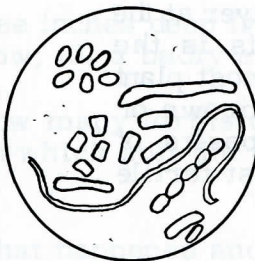
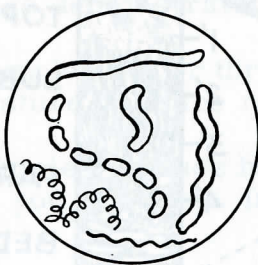
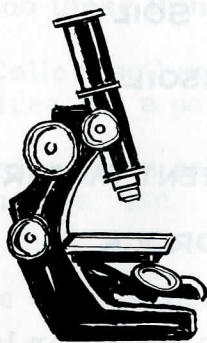
The first plant life to appear on earth probably were very small plants growing on bare rock. These plants were lichens and mosses which, during their growth, gave off very weak acids. These acids aided the weathering process by further breaking down the rocks. As the lichens and mosses died they added a small amount of organic residue to the weathered rock. This in turn made it possible for larger plants to grow.

As this process continued, still more organic residue was mixed with the weathered rock. Then larger plants were able to grow. These plants in turn added even larger amounts of organic matter. This decayed plant material is the source of the organic portion of the soil. After the organic matter has completely decayed so that it no longer shows any likeness to plant stems, leaves or roots, it is called humus. Humus is responsible for giving the soil we see today its dark brown or black color.



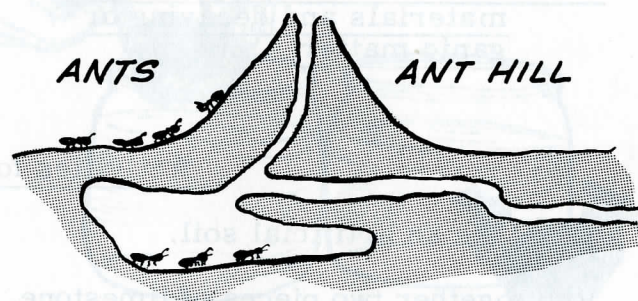
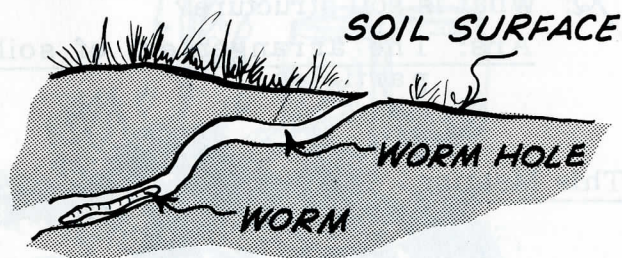
Soil Life

You have learned that the soil is made from rocks and decayed plant material. It is also the home of many forms of life. These forms of life range in size from bacteria too small to be seen without a microscope to such things as mice and moles. The bacteria and other extremely small living bodies use dead plant material as food. This process we call decaying or rotting. There are very large numbers of these plant and animal organisms in the soil. A teaspoonful of silt loam soil may contain as many as four billion living microbes.



In the larger group of animals in the soil the earthworm is the most important. This is because of the large number of earthworms compared to other animals such as mice and moles. There may be as many as a million or more earthworms in an acre of soil. When these worms dig through the soil they mix the soil, help water and air pass through the soil easier, and help make nutrients available to plants.

The forms of life found in soil are not considered to be soil forming materials themselves until they die. The fertility of the soil is closely related to the amount of life found in it.



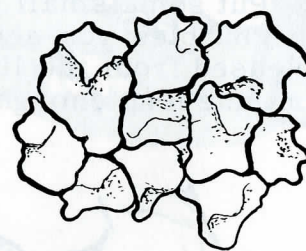
Soil Structure

The way individual soil particles are grouped together or arranged to form larger pieces of soil is called "structure." Soil may be in single grains or a number of particles may stick together in small groups called granules. Continued larger grouping of the granules may be in forms that resemble blocks, columns, or irregular layers of paper.



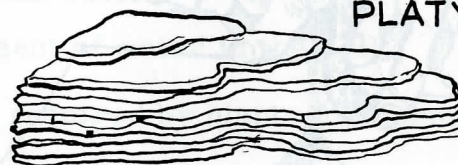
GRANULAR OR
PEA-SHAPED

BLOCKY



The kind of structure helps scientists determine many things about the soil. They can tell how it was formed; whether it is a good soil to farm; how well water and air can get into the soil; how much water the soil will hold, and many other things.

Organic matter, humus, and the living bodies in the soil are important in structure formation. They also help prevent soil structure from being destroyed by farming operations and rainfall. These things help to improve the soil "tilth" or the ease with which soil can be cultivated.



PLATY

The Layers of Soil

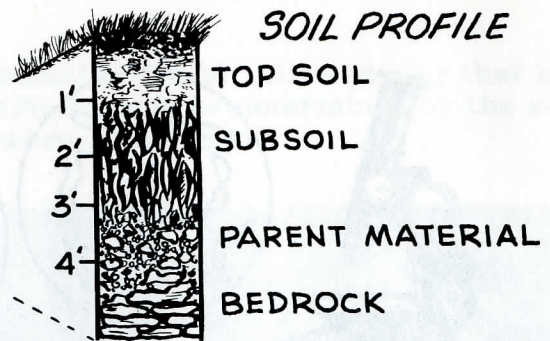
The uppermost layer or the layer at the surface is called topsoil. This is the layer in which plants grow and most plant roots are found. It has a dark brown or black color because of the deposits of organic matter. This is the most fertile part of the soil.

Between the topsoil and parent material is a layer called the subsoil. Although less fertile than the topsoil, it serves an important purpose for storing additional moisture and plant nutrients. Few plant roots will be found in the subsoil and it is lighter colored than the topsoils because it contains much less organic matter.

Questions and Answers

Q: What is soil?

Ans: Soil is a mixture of weathered materials and decaying organic matter.



Q: What are the three major layers of soil?

Ans: Topsoil, subsoil, and parent material.

Q: What makes up soil?

Ans: Water, air, organic matter, living organisms and mineral matter.

Q: What is soil structure?

Ans: The arrangement of soil particles.

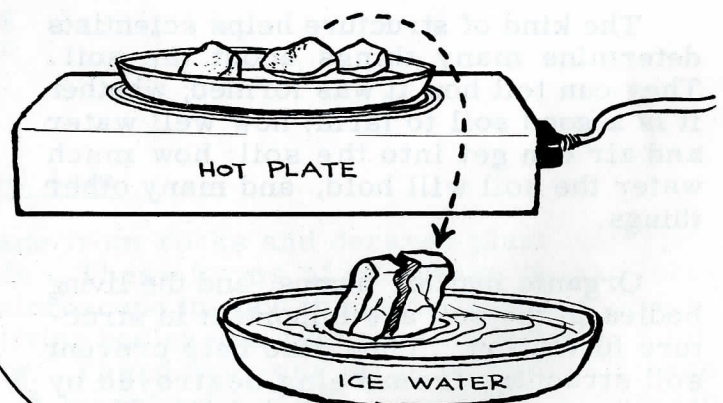
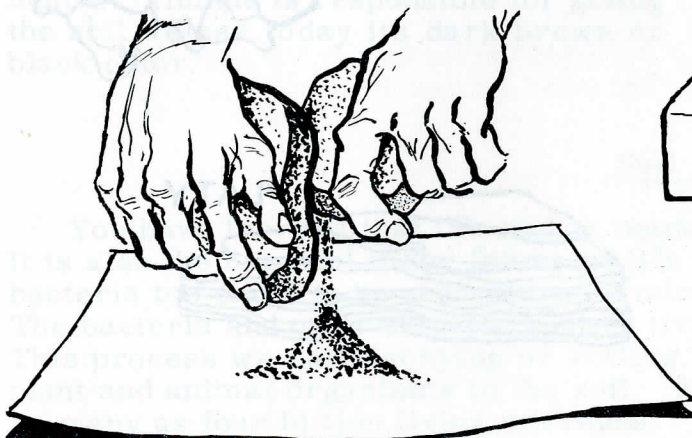
Activities for This Meeting

1. Make an artificial soil.

Rub together two pieces of limestone, fine sand stone, brick, or concrete. Notice how slowly the large pieces of rock wear down.

Heat a small piece of limestone on the stove. Drop it while still hot into a pan of ice water. What happens? Rapid heating and cooling breaks up rocks.

Put some small pieces of limestone in a little vinegar and heat over the stove. The bubbles you see are carbon dioxide gas made from carbon and oxygen being released from the limestone by chemical action. If this process were allowed to continue long enough all the limestone would slowly break down.



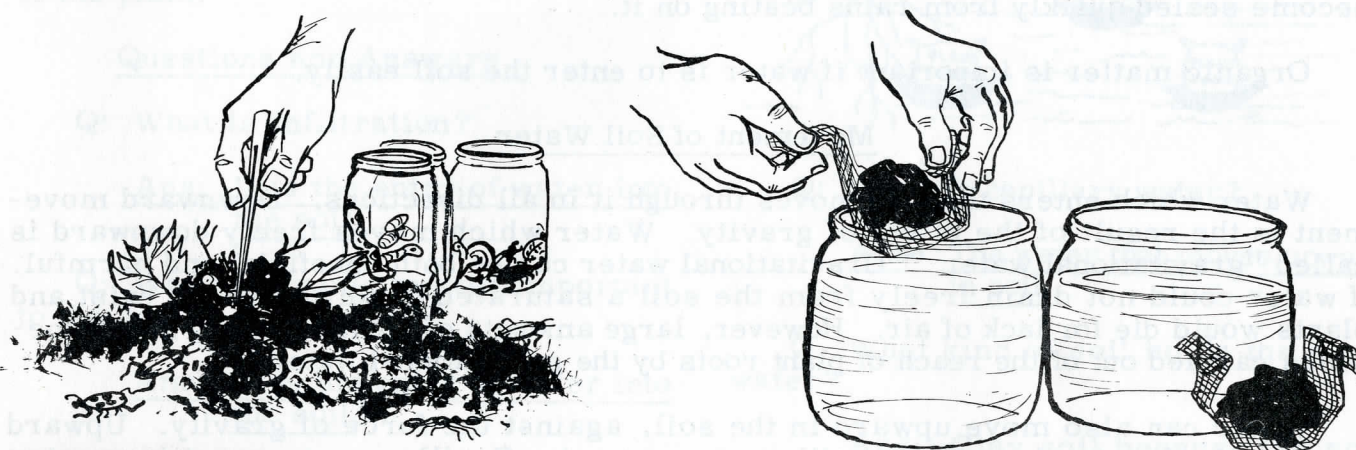
How do these things demonstrate weathering processes?

2. Collect soil samples two or three inches deep from (1) an ungrazed or unfarmed wooded area; (2) a pasture or fence row; (3) a badly eroded field.

Examine these samples and see how many forms of life, such as worms, snails, slugs, insects, etc., you can find. In which soil did you find the most living things? Why?

Write down in your record book what happened and why this happened.

3. Take two wide-mouthed glass jars or small fish bowls. Make a small wire rack of 1/4 inch hail screen which will go through the jar openings. Collect lumps of soil of a size that will fit into the wire racks from a cultivated field and from pasture. Fill the jars with water and slowly lower the baskets of soil into the water. Observe what happens. Why don't both lumps of soil act the same when placed in water? Write down in your record book what happened and why this happened.



UNIT

3

Soil Water

NEW WORDS TO LOOK FOR:

Infiltration: The entry of water through the soil surface.

Infiltration rate: Rate at which water enters the soil.

Gravitational water: Water which, under the force of gravity, moves freely downward through the soil and out of the reach of plant roots.

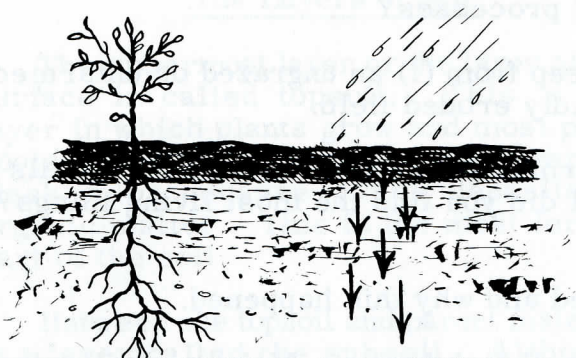
Capillary movement: The upward movement of water in the soil.

Plant nutrients: The necessary elements required by plants for normal growth.

Water Enters the Soil

Soil is a storage tank for water. It stores the water which falls as rain or is applied by irrigation until plants can use it.





**EASILY WORKED SOIL WITH A
GOOD SUPPLY OF ORGANIC MATTER**



**HARD LAYER OF SOIL -
LOW IN ORGANIC MATTER**

Entry of water into the soil is termed "infiltration." The rate of infiltration is determined by the condition of the surface of the soil and the topsoil. Soil which does not contain organic matter or does not have a protective cover of organic matter will become sealed quickly from rains beating on it.

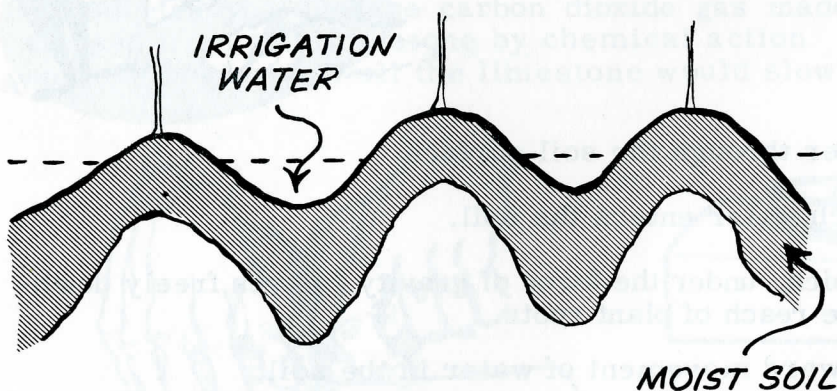
Organic matter is important if water is to enter the soil easily.

Movement of Soil Water

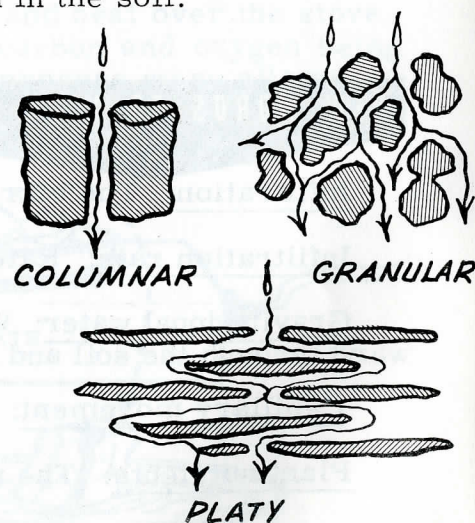
Water which enters the soil moves through it in all directions. Downward movement is the result of the effect of gravity. Water which moves freely downward is called "gravitational water." Gravitational water can be both beneficial and harmful. If water could not drain freely from the soil a saturated condition would exist and plants would die for lack of air. However, large amounts of plant nutrients are sometimes carried out of the reach of plant roots by the gravitational water.

Water can also move upward in the soil, against the force of gravity. Upward movement of water is called capillary movement. Capillary movement is greater in slightly moist soil than in dry soil.

The structure of the soil aids or retards the movement of water in the soil. This is the case whether water is moving downward into the soil as a result of rainfall or irrigation, or whether it is capillary water moving upward in the soil.



**WATER MOVES IN ALL DIRECTIONS
IN THE SOIL**



**WATER MOVES THROUGH
COLUMNAR & GRANULAR
SOILS EASIER THAN PLATY..**

Storage of Soil Water

The soil acts much like a sponge in its ability to hold water. This is important if water is to be available for plants during their growing period. As the water trickles through the soil it becomes attached to the individual soil particles as a thin film. Thus the more fine soil particles in a soil the more water a soil will hold. This is why a clay soil will hold more water than an equal volume of sandy soil. A soil high in organic matter (humus) can hold many times more water than one low in organic matter. This is another reason why soil organic matter should be maintained at a high level.

Soil Water Transports Plant Food

Plant nutrients must be in solution before plants can use them. Water stored in the soil dissolves the nutrients and transports them to the plant roots. Water is also a source of hydrogen and oxygen to the plant.

Questions and Answers

Q: What is infiltration?

Ans: It is the entry of water into the soil.

Q: Why is organic matter important to the soil?

Ans: Aids the entry of water into the soil.

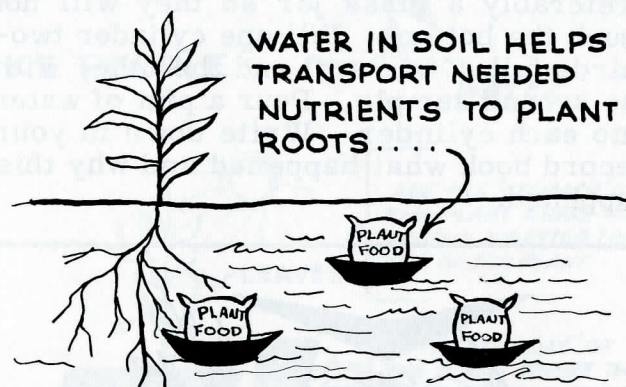
Q: What is gravitational water?

Ans: The water that moves downward in soil.

Activity for This Meeting

1. Get three old-fashioned lamp chimneys or plastic cylinders and three shallow pans or jars which the cylinders or lamp chimneys will fit into. Fasten a cloth over one end of the cylinders or lamp chimneys. Turn them upside down and fill one with sand, one with clay soil, and one with soil from your garden. Tap the containers so the soil will be firmly settled. Set the cylinders into the pans and fill the pans with water.

Keep a record of how fast and how high the water rises in each cylinder. We know water will move downward in the soil. This demonstration shows that



Q: What is capillary water?

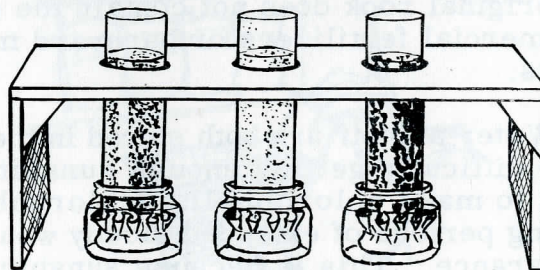
Ans: The water that moves upward in soil.

Q: What kind of soil holds the most water?

Ans: Clay soil because the soil particles are small and thus have more surface area volume for volume than other soils.

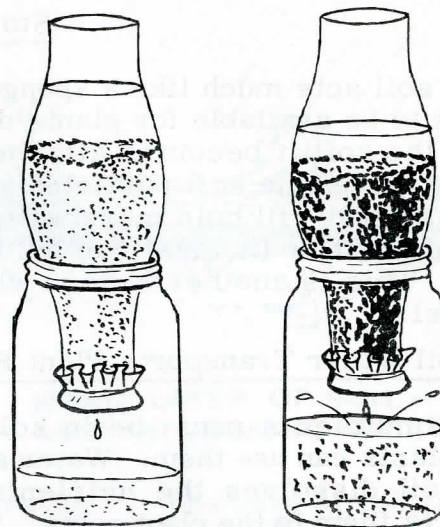
it will move upward also and that the soil texture is an important factor in its movement.

Write down in your record book what happened and why this happened.



2. Collect a quart of soil from a field or garden that has been cultivated for several years. Collect a second sample from a pasture or roadside which has grass growing on it.

Take two of the lamp chimneys or cylinders used in the previous demonstration and fasten a cloth over one end of each. Set the cylinders in a receptacle, preferably a glass jar so they will not touch the bottom. Fill one cylinder two-thirds full of one soil and the other with the second sample. Pour a pint of water into each cylinder. Write down in your record book what happened and why this happened.



NEW WORDS TO LOOK FOR:

Plant deficiency symptoms: The abnormal appearance of leaves and stems which help tell the plant's need for a particular nutrient.

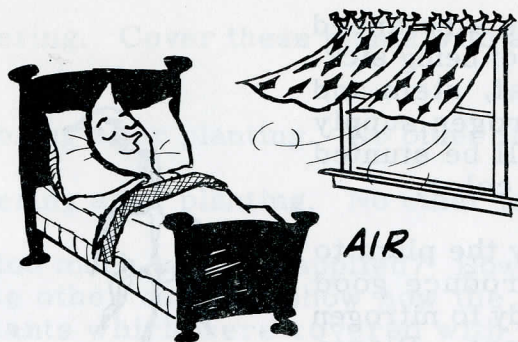
Internal drainage: Downward drainage of excess water from within the soil. The water which drains away is the gravitational water.

Plants Are Like People

Plants are like people in that they must have food, water, air, and sunshine to live and grow. If any one of these is not supplied in adequate amounts the plant will suffer and possibly die.

The food (nutrients) is supplied for the most part by the soil. As rocks are broken down and organic matter decays, they act as a source of nutrient supply. Sometimes the original rock does not contain the essential nutrients needed for plant growth and commercial fertilizers or barnyard manure must be used to supply the needs of the plants.

Water and air are both stored in the soil for the plants to use. Plants usually have little difficulty getting enough sunshine. Sunshine and nutrients are needed by the plant to make chlorophyll. Chlorophyll is the green colored material in plants. During periods of extended cloudy weather, plants will sometimes have a pale green appearance. This is because sunshine has not been available to make chlorophyll.



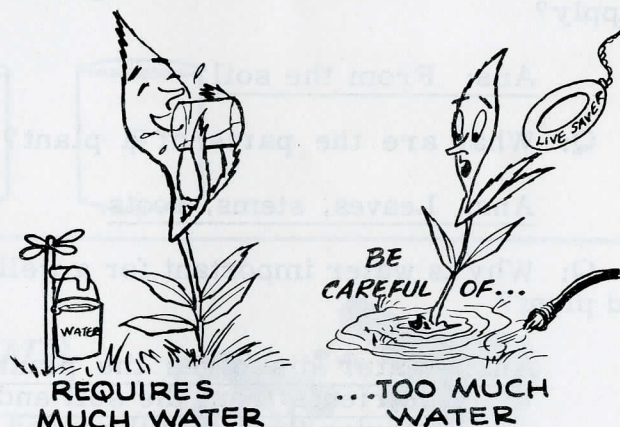
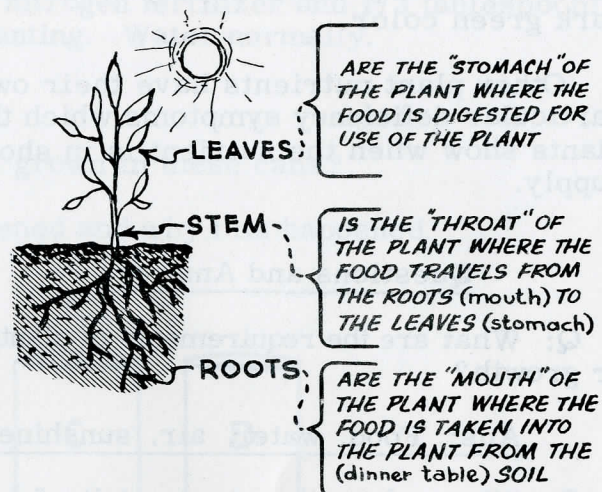
"PLANTS ARE LIKE PEOPLE"

The parts of the plant take care of its needs similarly to the way parts of our own body help us live. Plants cannot chew their food but must "drink" it. The water stored in the soil dissolves plant nutrients found in the soil and the plants take them in through their roots. Many of our plants have more than three-fourths of their total weight as water. It is easy to see why the water requirement of plants is so great.

Although plants require large amounts of water it is possible for them to have too much. When all the soil pores become filled with water so there is no air, the plant may die. In this respect a plant is again very much like people in that we also need fresh air. Level soils with large amounts of clay in them have a rather slow internal drainage. These soils are more likely to cause drowning of plants than soils with small amounts of clay or sandy soils.

A plant must have food if it is to grow and produce a crop. It must be the right food and in the right amounts. There are 16 nutrient elements considered essential for the growth of green plants. Some are required in larger amounts by plants than are others. This does not mean, however, that one nutrient element is more important than another. They all must be available to plants in sufficient amounts if the plant is to produce top yields.

The mineral nutrients required in largest amounts by plants are calcium, nitrogen, phosphorus, and potassium. These are primary nutrients. With the exception of potassium, many Nebraska soils must have additional applications of these nutrients for top production. In the future they may even require potassium.



Plants which do not have a balanced diet show very definite signs of being sick. Plants need nitrogen for leaf, stem and seed growth. When the nitrogen supply is not adequate the plant will be stunted and have a yellowish green color.

Phosphorus is needed by the plant to develop strong roots and produce good seeds. It also acts as a buddy to nitrogen by helping it get into the plant. Plants which don't get enough phosphorus are slow growing, have poor root systems, and show a very distinct purple or very dark green color.

Other plant nutrients have their own particular deficiency symptoms which the plants show when the nutrient is in short supply.

Questions and Answers

Q: What are the requirements of plants for growth?

Ans: Food, water, air, sunshine.

Q: Where does the plant get its food supply?

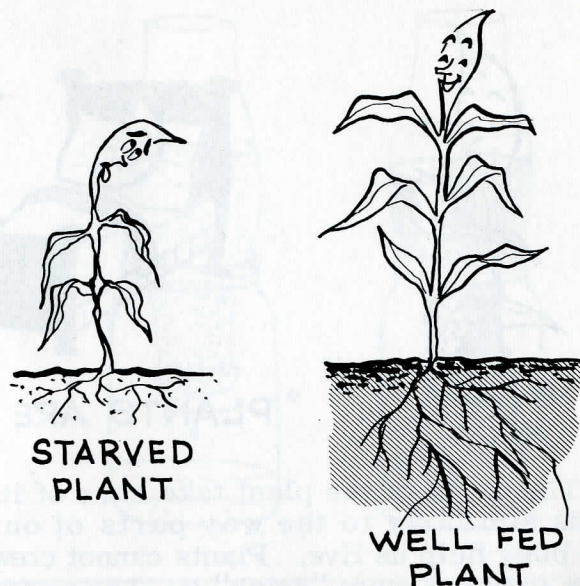
Ans: From the soil.

Q: What are the parts of a plant?

Ans: Leaves, stems, roots.

Q: Why is water important for a well fed plant?

Ans: Water dissolves the plant nutrients from the soil and carries them into the plant.



Q: How many elements are essential for plant growth?

Ans: 16

Q: What nutrients are needed in largest amounts for plant growth?

Ans: Calcium, nitrogen, phosphorus, potassium.

Q: Why is nitrogen essential for plant growth?

Ans: It is necessary for leaf, stem and seed growth.

Q: Why is phosphorus essential for plant growth?

Ans: It is essential for strong roots and to produce good seed.

Activities for This Meeting

1. Fill four large vegetable cans with topsoil from your garden. These will be cans A, B, C, D. Punch drainage holes in the bottom of cans A, B, and C. Fill two more cans with subsoil and punch drainage holes in each can. These will be cans E and F.

Plant three or four beans in each of the cans A, B, C and D. Treat A, B, C and D as follows:

Can A: No watering at all.

Can B: Normal watering. Cover these plants with a paper bag when they are 2" high.

Can C: Normal watering after planting. No other treatment.

Can D: Normal watering after planting. No other treatment.

What happens when too much water is applied? How did the plant grow where no water was applied? The other can will show how the plant would normally grow. What happened to the plants which were covered with the paper sack?

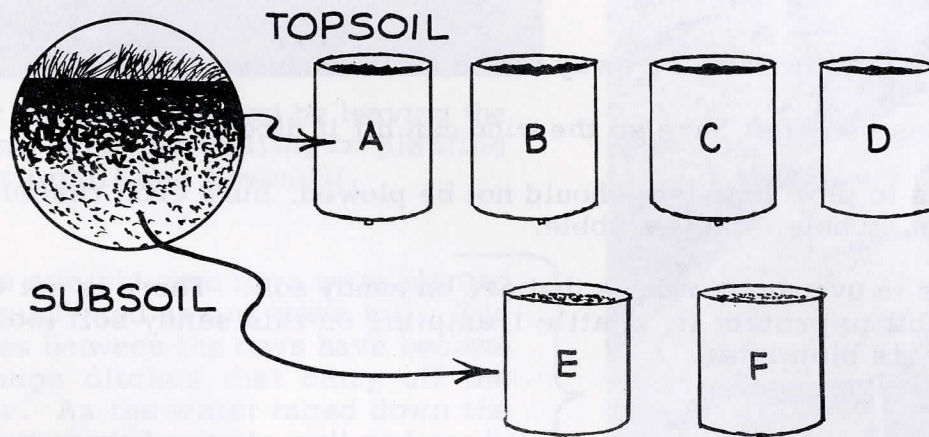
Treat cans E and F as follows:

Can E: Mix about $\frac{2}{3}$ of a tablespoonful of nitrogen fertilizer and $\frac{1}{3}$ tablespoonful of phosphorus fertilizer with the soil before planting. Water normally.

Can F: Water normally after planting.

Do you see a difference between the plants grown in these cans?

Write down in your record book what happened and why this happened.



UNIT

5

How do we lose soil?



NEW WORDS TO LOOK FOR:

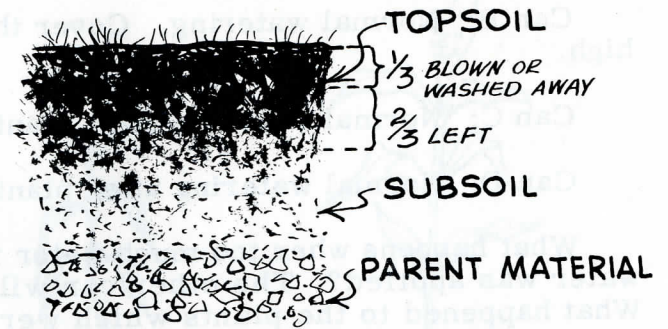
Crop residue: The portion of a plant, or crop, left in the field after harvest.

Crop rotation: The growing of different crops in recurring succession on the same land.

Erosion: Is the wearing away of land by forces of wind and water.

Gully: A channel or miniature valley cut by running water.

When we started farming our land in the United States, we had an average of about nine inches of topsoil over all of our cultivated acres. Today there is an average of only six inches of topsoil. We have lost about one-third of our topsoil by erosion.



What Is Erosion?

Erosion is the wearing away of land by forces of wind and water. This is the land that has been lost by covering over other land at the bottom of the hills, deposited along stream banks, or washed away by streams and rivers to the Gulf of Mexico or the oceans.

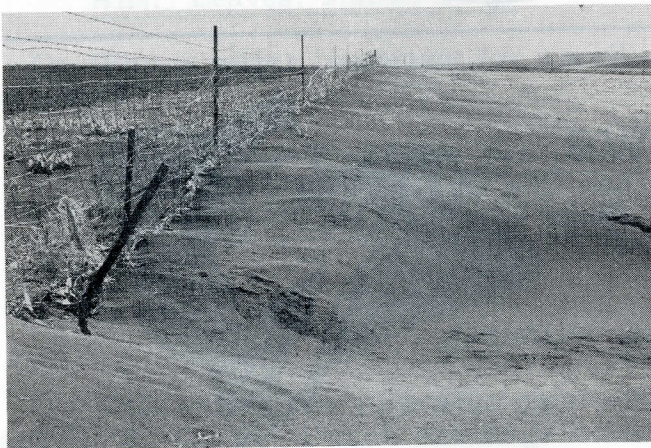
What Are the Kinds of Erosion?

There are two main kinds of erosion, wind and water.

Wind Erosion

We have wind erosion (the blowing away of the soil) because:

1. The ground has been left bare so the wind can hit it directly.
2. Man continues to plow land that should not be plowed, burn crop residues like corn stalks, sorghum stubble, wheat stubble.
3. Man continues to overgraze ranges that are on sandy soil. There is not enough grass covering the soil to protect it. Cattle trampling on this sandy soil loosens it and then the wind starts blowouts.



Good topsoil that has been blown off of the field into a fence row.



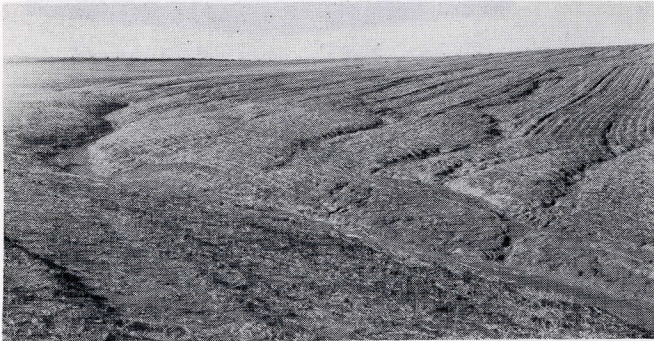
Man has burned cornstalks and small grain stubble leaving the surface of the soil bare. Now when winds come, the loose soil will blow away and when it rains there is nothing there to protect the soil from washing away.

Water Erosion

There are two kinds of water erosion - sheet and gully erosion. Sheet erosion is the more or less uniform washing off of layers of topsoil. It might be compared to a big paring knife that has gone over a field and cut a few inches of soil from the surface.

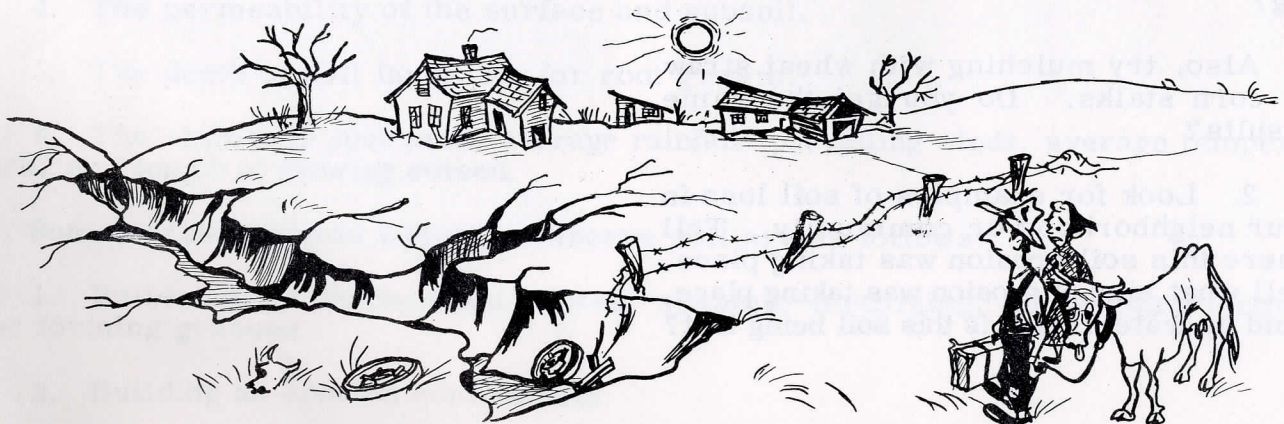
A second kind of water erosion is Gully Erosion. A gully does great damage to a farm. If its growth is not stopped it may destroy the whole farm. It may eventually cause the farmer to abandon his land and leave the community.

What causes gullies? Gullying is caused by running water. How fast gullies grow depends on how hard it rains, steepness of the slope, kind of soil on the farm, and how the land has been used.



Sheet erosion is caused by leaving the ground bare, by drilling or planting crops uphill and downhill.

These straight corn rows were planted and cultivated up and down hill. The spaces between the rows have become drainage ditches that carry off the water. As the water raced down the slope it carried away topsoil and seed. Plant foods (nutrients) in the topsoil were also lost along with the water that caused the erosion.



Questions and Answers

Q: What was the average depth of topsoil when farmers started farming the land in the United States

Ans: Nine inches.

Q: What is the average depth of topsoil in the United States today?

Ans: Six inches.

Q: What is erosion?

Ans: Erosion is the wearing away of the land by forces of wind and water.

Q: What are the kinds of erosion?

Ans: Wind and water.

Q: What are the two kinds of water erosion?

Ans: Sheet and gully.

Activities for This Meeting

1. Take a shallow pan or box and fill it with dry soil.

Place it on a table against a wall.

Place an electric fan in front of the pan with air passing over the soil.

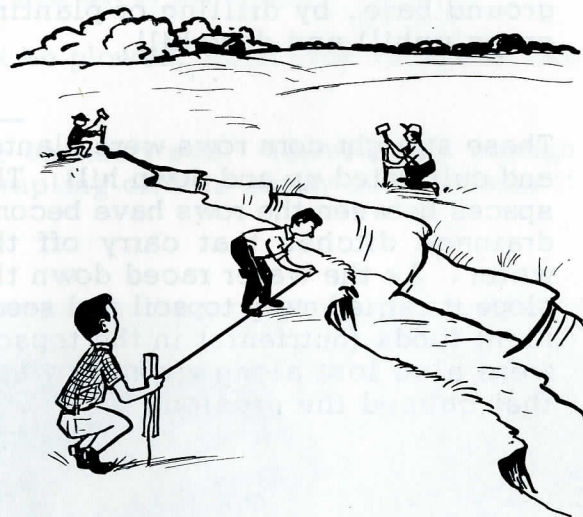
What happens?

Take another shallow pan or box and fill it with soil, and plant wheat and oats in the soil. Water, and let the plants grow to 2 inches in height. Then set an electric fan in front of the box.

Does vegetation control the soil blowing?

Also, try mulching with wheat straw or corn stalks. Do you get the same results?

2. Look for examples of soil loss in your neighborhood or community. Tell where this soil erosion was taking place. Tell what kind of erosion was taking place, wind or water. Why is this soil being lost?



UNIT 6

How can we conserve the soil ?



NEW WORDS TO LOOK FOR:

Permeability: The condition of the soil that enables air and water to move through it.

Contour: An imaginary line on the surface of the earth connecting points of the same elevation.

Contour farming: Conducting field operations, such as plowing, planting, cultivating, and harvesting on the contour or at right angles to the direction of the slope.

Cover crop: A close growing crop grown primarily for the purpose of protecting and improving soil between periods of regular crop production.

Terrace: An embankment or ridge of earth constructed across a slope to control runoff and minimize soil erosion.

Field strip cropping: A system of growing crops in parallel strips laid out across the general slope or at right angles to the prevailing wind direction.

There are a number of ways to conserve soil. The important things to know are the reasons why you should use certain practices. Before conservation practices can be established you must know:

1. The soil; is it sandy, silty or clay?
2. The slope of the land.
3. The type of erosion and how much has taken place.
4. The permeability of the surface and subsoil.
5. The depth of soil favorable for root growth.
6. The climate in your area, average rainfall, prevailing winds, average temperature, and length of growing season.

Some of the common ways to conserve soil are as follows:

1. Bulldozing-in ditches and gullies, shaping, fertilizing, and seeding them to sod forming grasses.
2. Building an erosion control dam.

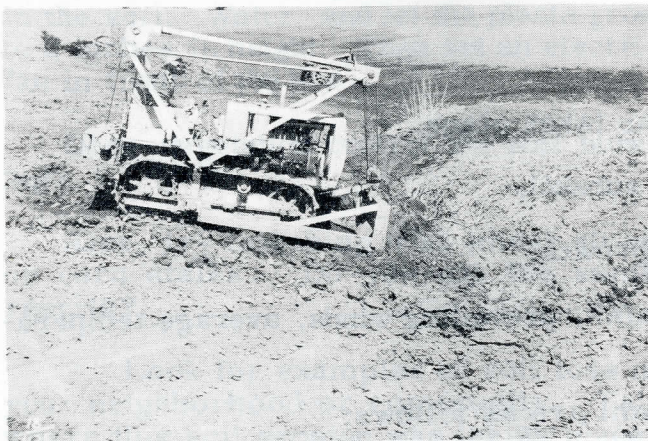
3. Contour farming.
4. Terracing.
5. Using a good crop rotation including the use of grasses and legumes.
6. Seeding eroded land to grass.
7. Keeping the ground covered with growing cover or crop residues.
8. Windstrip cropping.
9. Field shelterbelts.
10. Proper pasture and range management.
11. Drainage practices.

Gully Control by Seeding Sod Forming Grasses

Gullies are controlled by several different methods. Many gullies can be stopped by using a bulldozer or a road patrol to push down the banks and make the bottom of the gully flat. The bottom and sides of the gully should then be fertilized with barnyard manure or commercial fertilizer and seeded to sod forming grasses. It is often necessary to construct a fence around the gully to protect it from grazing of livestock.



- ① Don't let the gullies divide fields, but....



- ② Bulldoze them in, smooth and fertilize them; then....



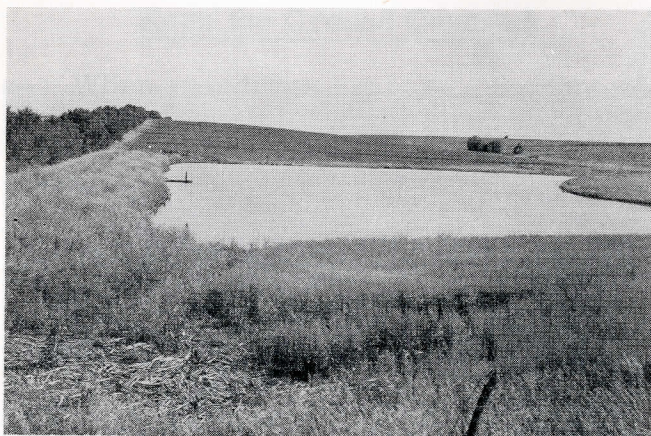
- ③ Seed to grass. Harvest hay or seed from them.

Gully Control by Building "Erosion Control Dams"

Another method of gully control is to build an earthen dam so that the runoff water is held in the gully. If the dam is built at the right location, it will stop the gully from washing back into the field. Such a dam must have a good grassed spillway or a metal or concrete tube through the dam so the pond may overflow without damage to it.



Don't let large gullies eat away your farm like this.



Build an erosion control dam. It will stop a gully from working back into the farm. Also provide a place for swimming and fishing.

Conserving Soil with "Contour Farming"

Farming operations such as plowing, planting, cultivating and harvesting are done parallel with the terraces. By following this method of farming, the terraces are more easily maintained and will perform their job much more satisfactorily. This is also known as contour farming.



Notice the poor stand of corn by planting uphill and downhill. So we don't grow very good crops.



Farming around the hill helps us to get water into the soil. This is done parallel with the terraces.

Crop Rotations

The maintenance of high organic matter in the soil is very important in the control of erosion. Plowing under grasses, adding barnyard manure, returning alfalfa, sweetclover, red clover and other crops to soil increases the organic matter and tilth of the soil. By tilth we mean the ease with which the soil plows and is cultivated. A good rotation should be selected that will keep "cover" on the land most of the time.



We improve the "tilth" of our soils making it easier to farm and improving its capacity to take in water by planting alfalfa and grass in the cropping system.



Other legumes such as sweetclover add fertility to our soils.

Conserving Soil with "Terraces"

Terraces are long embankments of earth built to stop the flow of water directly down the slope. In drier sections of Nebraska, terraces are built level or with a slight grade to lead excess water to a grassed waterway.



Don't let ditches wash in the fields, but



build terraces around the hill. Each ridge of earth prevents water from washing down the hill, and leads it around very slowly to grassed waterway. This gives the water a chance to soak into the ground.

Conserving Soil with "Grass"

Grass, when properly treated, is one of the most effective practices available for conserving and improving the soil. Grass is used in several ways in conservation farming: (1) for seeding waterways and gullies, (2) for pasture, (3) for a cash crop seeded for a seed crop, (4) for dams and spillways, (5) for hay production, and (6) in the crop rotation to improve its structure.



Don't farm land that is too steep to cultivate. Water runs off very fast. You can't grow good cultivated crops on this type of land.

A good grass crop protects and improves the soil in several ways: (1) it prevents soil erosion, (2) improves soil structure, (3) increases soil productivity, and (4) improves the biological life in bacteria, earthworms, and other life in the soil. Both the tops and roots of grass plants help to do these things.



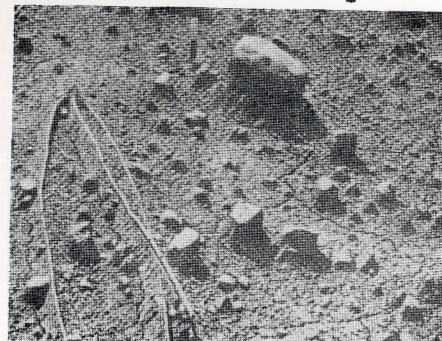
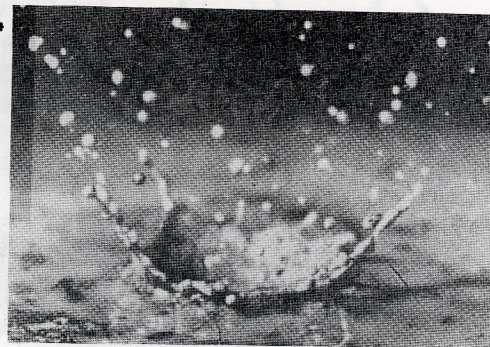
But seed it to grass. The soil under the grass will be like a sponge, and with good clover like this--will absorb much of the rain that falls.

Keep the Ground Covered

When raindrops hit bare, unprotected soil, the force of the raindrop jars particles of soil loose. It is then carried away.



Keep the soil covered with wheat straw, corn or sorghum stubble as much of the time as possible.



Questions and Answers

Q: What are some of the things you should know about your farm before establishing conservation practices?

Ans: Features of the soil such as, texture, permeability, structure and depth of the surface soil. Also the type and amount of erosion that has taken place and the slope of the land.

Q: What are some of the ways to conserve soil?

Ans: Gully control, building dams, contour farming, terracing, good rotations, seeding non-productive land to grass, field shelterbelts, proper pasture and range management, and proper drainage practices.

Activities for This Meeting

1. Take a conservation tour in your community. Make a list of conservation practices that you observed and tell why each is used.

2. Invite a Soil Conservation Service technician or the county agent to your meeting and have him show colored slides of conservation in your county.

3. Build a model farm showing recommended conservation practices.

